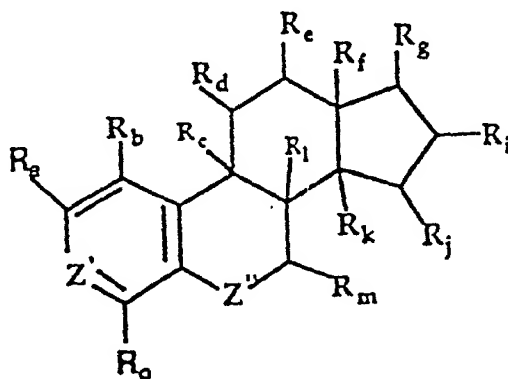


Claims

- 1 1. A method for treating a mammalian disease
2 characterized by abnormal cell mitosis, said method
3 comprising administering to a mammal a cell-mitosis-
4 inhibiting compound of the formula below, said compound
5 being administered in an amount sufficient to inhibit cell
6 mitosis:

7



8 wherein:

9 I. R_a-R_o are defined as follows:

- 10 A) each R_a, R_b, R_c, R_d, R_e, R_f, R_g, R_h, R_i, R_j, R_k, R_l,
11 R_m, R_o, independently is -R₁, -OR₁,

12 $-\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br}, \text{ or } -\text{I}; \text{ and } \text{R}_g$
 13 $\text{is } -\text{R}_1, -\text{OR}_1, -\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br},$
 14 $-\text{I}, \text{ or } -\text{C}\equiv\text{CH};$

15 or

16 B) each $\text{R}_a, \text{R}_b, \text{R}_c, \text{R}_f, \text{R}_k, \text{R}_l, \text{R}_o,$
 17 independently is $-\text{R}_1, -\text{OR}_1, -\text{OCOR}_1, -\text{SR}_1,$
 18 $-\text{F}, -\text{NHR}_2, -\text{Br}, \text{ or } -\text{I}; \text{ and each } \text{R}_d, \text{R}_e, \text{R}_i,$
 19 $\text{R}_j, \text{R}_m, \text{independently is } =\text{O}, -\text{R}_1, -\text{OR}_1,$
 20 $-\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br} \text{ or } -\text{I}; \text{ and } \text{R}_g$
 21 $\text{is } =\text{O}, -\text{R}_1, -\text{OR}_1, -\text{OCOR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2,$
 22 $-\text{Br}, -\text{I}, \text{ or } -\text{C}\equiv\text{CH};$

23 and

24 II. Z' is defined as follows:

25
 26 A) Z' is X, where X is $\begin{array}{c} \text{O} \\ | \\ >\text{COR}_1, >\text{CC}-\text{R}_1, \end{array}$
 27

28 $\begin{array}{c} \text{O} \\ | \\ >\text{CC}-\text{OR}_1, \end{array}$ $\begin{array}{c} \text{OH} \\ | \\ >\text{CC}-\text{R}_1, \end{array}$ $\begin{array}{c} \text{OH} \\ | \\ >\text{CC}-\text{OR}_1; \end{array}$
 29
 30

31 or

32 B) Z' is $\begin{array}{c} \text{O} \\ || \\ \text{C}-\text{X}'- \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{O} \\ || \\ \text{X}'-\text{C}- \\ | \\ \text{R}_n \end{array}$, where R_n
 33
 34 is $-\text{R}_1, -\text{OR}_1, -\text{SR}_1, -\text{F}, -\text{NHR}_2, -\text{Br} \text{ or } -\text{I};$
 35 and X' is X, as defined above; or X' is
 36 $>\text{C}=\text{O};$
 37

38 and

39 III. Z'' is defined as follows:

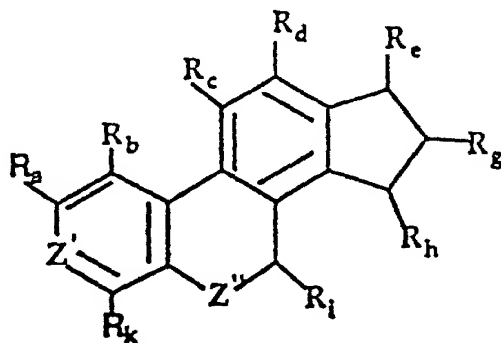
40
 41 A) Z'' is Y, where Y is $\begin{array}{c} \text{R}_1 \\ | \\ -\text{O}-, -\text{N}-, >\text{CHR}_1, \end{array}$
 42

43 $\begin{array}{c} \text{R}_1 \\ | \\ >\text{C}=\text{O}, >\text{C}-(\text{CH}_2)_n\text{OR}_2, \end{array}$
 44
 45

82 R_g is $-OH$;
 83 Z' is $>COH$; and
 84 Z'' is $>CH_2$;
 85 then R_a is not $-H$;
 86 where, in each formula set forth above, each R_1 and R_2
 87 independently is $-H$, or substituted or unsubstituted alkyl,
 88 alkenyl or alkynyl group of 1-6 carbons.

1 2. A method for treating a mammalian disease
 2 characterized by abnormal cell mitosis, said method
 3 comprising administering to a mammal a cell-mitosis-
 4 inhibiting compound of the formula below, said compound
 5 being administered in an amount sufficient to inhibit cell
 6 mitosis:

7



8 wherein:

9 I. R_a-R_k are defined as follows:

10 A) each $R_a, R_b, R_c, R_d, R_g, R_h, R_i, R_k$
11 independently is $-R_1, -OR_1, -OCOR_1, -SR_1,$
12 $-F, -NHR_2, -Br, \text{ or } -I$; and R_e is $-R_1, -OR_1,$
13 $-OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or $-C\equiv CH$;

14 or

15 B) each R_a, R_b, R_c, R_d, R_k independently is
16 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, \text{ or }$
17 $-I$; and each R_{eg}, R_h, R_i independently is
18 $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -Br, \text{ or }$
19 $-I$; and R_e is $=O, -R_1, -OR_1, -OCOR_1, -SR_1,$
20 $-F, -Br, -I$ or $-C\equiv CH$;

21 and

22 II. Z' is defined as follows:

23 A) Z' is X, where X is $\begin{array}{c} O \\ | \\ >COR_1, >CC-R_1, \end{array}$
24
25

26 $\begin{array}{c} O \\ | \\ >CC-OR_1, \end{array}$ $\begin{array}{c} OH \\ | \\ >CC-R_1, \end{array}$ $\begin{array}{c} OH \\ | \\ >C-C-OR_1; \end{array}$
27
28

29 or

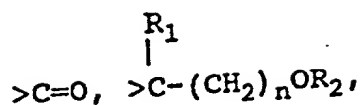
30 B) Z' is $\begin{array}{c} =C-X'- \\ | \\ R_n \end{array}$ or $\begin{array}{c} -X'-C= \\ | \\ R_n \end{array}$, where R_n
31
32 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I$,
33 and X' is X, as defined above;
34 or X' is also $>C=O$;

35
36 and

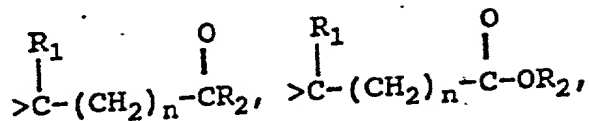
37 III. Z'' is defined as follows:

38 A) Z'' is Y, where Y is $\begin{array}{c} R_1 \\ | \\ -O-, -N-, >CHR_1, \end{array}$
39
40

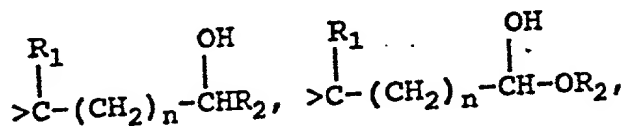
41
42
43



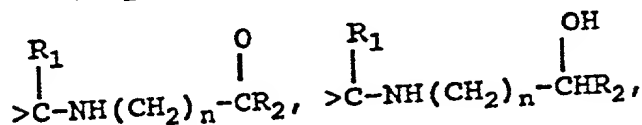
44
45
46



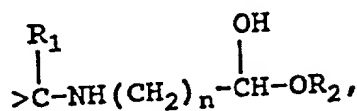
47
48
49



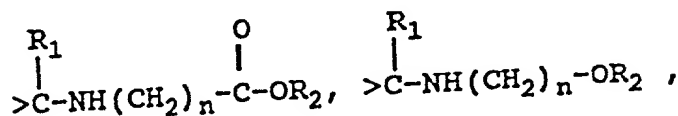
50
51
52



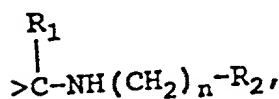
53
54
55



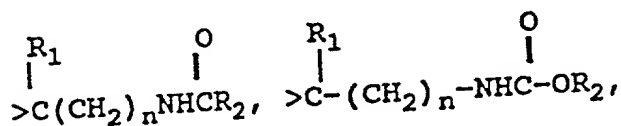
56
57
58



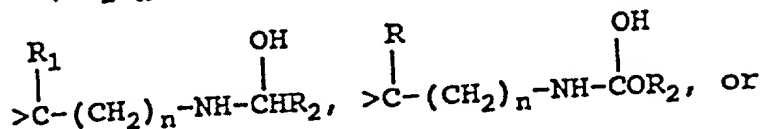
59
60
61



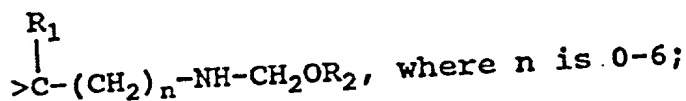
62
63
64



65
66
67



68
69
70



71 or

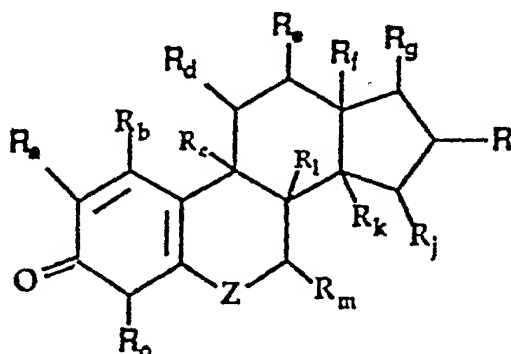
B) Z'' is $-Y-\underset{\substack{| \\ R_p}}{CH}-$ or $-\underset{\substack{| \\ R_p}}{CH}-Y-$, where R_p is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$;

72
73
74
75

76 where, in each formula set forth above, each R_1 and R_2
77 independently is -H, or substituted or unsubstituted alkyl,
78 alkenyl or alkynyl group of 1-6 carbons.

1 3. A method for treating a mammalian disease
2 characterized by abnormal cell mitosis, said method
3 comprising administering to a mammal a cell-mitosis-
4 inhibiting compound of the formula below, said compound
5 being administered in an amount sufficient to inhibit cell
6 mitosis:

7



8 wherein:

9 I. R_a-R_o are defined as follows:

10 A) each $R_a, R_b, R_c, R_d, R_e, R_f, R_i, R_j, R_k, R_l,$
11 R_m, R_o independently is $-R_1, -OR_1, -OCOR_1,$
12 $-SR_1, -F, -NHR_2, -Br, \text{ or } -I$; and R_g is $-R_1,$
13 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or
14 $-C\equiv CH$;

15 or

16

17

18

19

20

21

22

23 and

24 II. Z is defined as follows:

25

26

27

A) Z is Y, where Y is $\begin{array}{c} R_1 \\ | \\ -O-, -N-, >CHR_1, \end{array}$

28

29

30

31

32

33

34

35

36

37

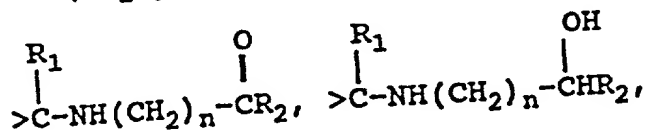
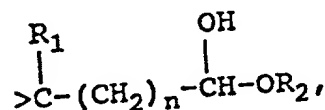
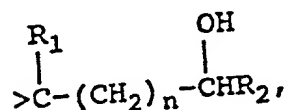
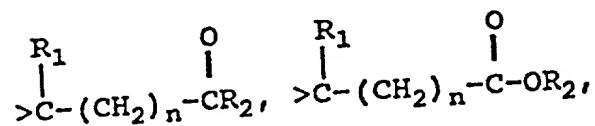
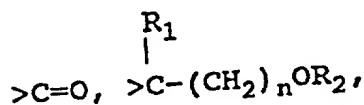
38

39

40

41

42



43

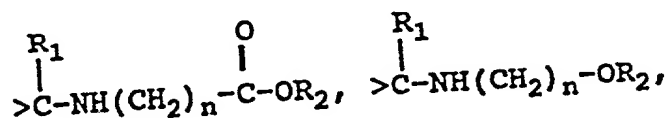
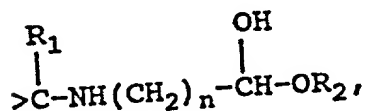
44

45

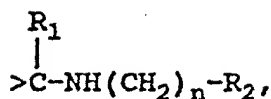
46

47

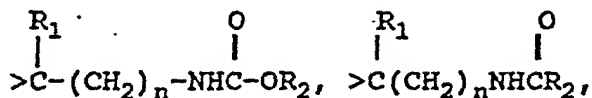
48



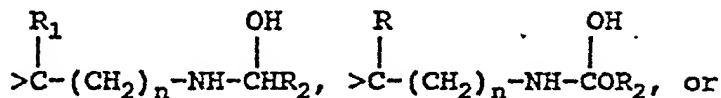
49
50
51



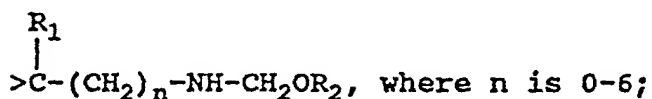
52
53
54
55



56
57
58

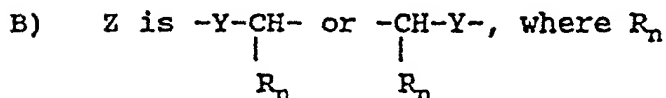


59
60
61



62 or

63
64
65



66

is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$;

67

where, in each formula set forth above, each R_1 and R_2

68

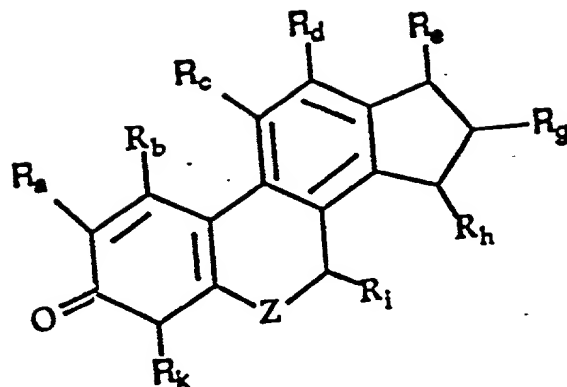
independently is $-H$, or substituted or unsubstituted alkyl,

69

alkenyl or alkynyl group of 1-6 carbons.

1
2
3
4
5
6

4. A method for treating a mammalian disease characterized by abnormal cell mitosis, said method comprising administering to a mammal a cell-mitosis-inhibiting compound of the formula below, said compound being administered in an amount sufficient to inhibit cell mitosis:



7 wherein:

8 I. R_a-R_k are defined as follows:

9 A) each $R_a, R_b, R_c, R_d, R_g, R_h, R_i, R_k$
 10 independently is $-R_1, -OR_1, -OCOR_1, -SR_1,$
 11 $-F, -NHR_1, -Br, \text{ or } -I$; and R_e is $-R_1, -OR_1,$
 12 $-OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$ or $-C\equiv CH$;

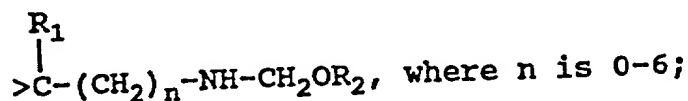
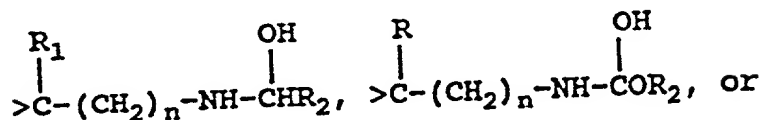
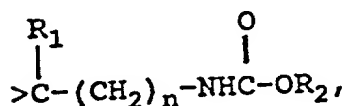
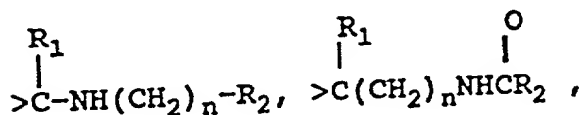
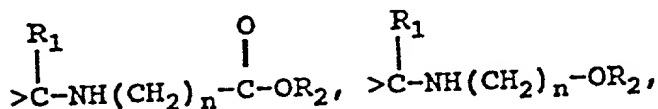
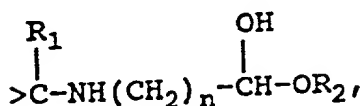
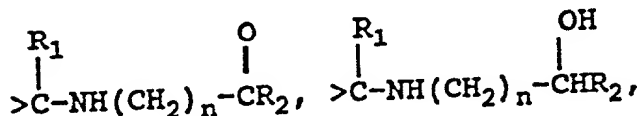
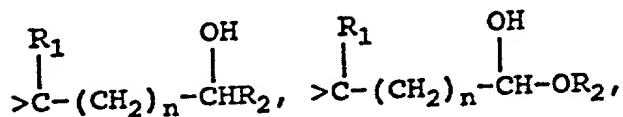
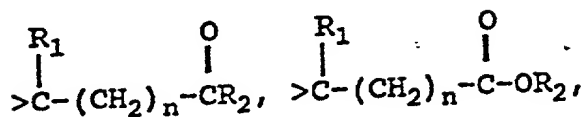
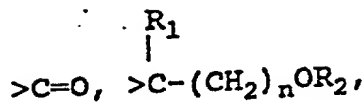
13 or

14 B) each R_a, R_b, R_c, R_d , independently is $-R_1,$
 15 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, \text{ or } -I$
 16 and each R_g, R_h, R_i, R_k independently is
 17 $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$
 18 or $-I$; and R_e is $=O, -R_1, -OR_1, -OCOR_1,$
 19 $-SR_1, -F, -NHR_1, -Br, -I$ or $-C\equiv CH$;

20 and

21 II. Z is defined as follows:

22
23
24 A) Z is Y, where Y is -O- , -N- , >CHR_1 ,



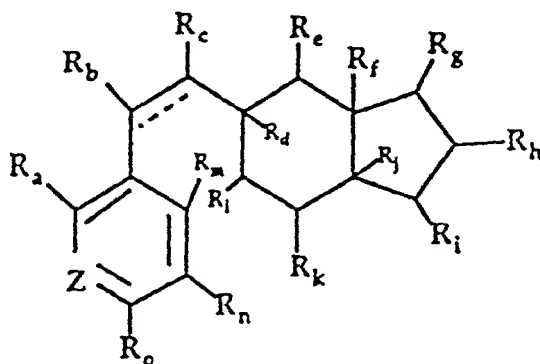
55 or

56 B) Z is -Y-CH- or -CH-Y- , where R_n
57 R_n R_n
58

59 is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$;
60 where, in each formula set forth above, each R_1 and R_2
61 independently is $-H$, or substituted or unsubstituted alkyl,
62 alkenyl or alkynyl group of 1-6 carbons.

1 5. A method for treating a mammalian disease
2 characterized by abnormal cell mitosis, said method
3 comprising administering to a mammal a cell-mitosis-
4 inhibiting compound of the formula below, said compound
5 being administered in an amount sufficient to inhibit cell
6 mitosis:

7



8 wherein:

9 I. R_1-R_{10} are defined as follows:

10 A) each $R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, R_{10}$,
11 R_1, R_m, R_n, R_o independently is $-R_1, -OR_1$,
12 $-OCOR_1, -SR_1, -F, -NHR_2, -Br$, or $-I$; and R_i
13 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br$,
14 $-I$ or $-C\equiv CH$;

15 or

16 B) each $R_a, R_d, R_f, R_j, R_m, R_n, R_o$
17 independently is $-R_1, -OR_1, -OCR_1, -SR_1,$
18 $-F, -NHR_2, -Br, \text{ or } -I$; and each $R_b, R_c, R_e,$
19 R_g, R_h, R_k, R_l independently is $=O,$
20 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or
21 $-I$; and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1,$
22 $-F, -Br, -I$ or $-C\equiv CH$;

23 or

24 C) each $R_a, R_b, R_c, R_d, R_f, R_j, R_m, R_n, R_o$
25 independently is $-R_1, -OR_1, -OCR_1, -SR_1, -F,$
26 $-NHR_2, -Br, -I$ and each R_e, R_g, R_h, R_k, R_l
27 independently is $=O, -R_1, -OR_1, -OCOR_1,$
28 $-SR_1, -F, -NHR_1, -Br$ or $-I$; and R_i is $=O,$
29 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -Br, -I$ or
30 $-C\equiv CH$;

31 II. Z is defined as follows:

32

33

34

A) Z is X, where X is $\overset{O}{\underset{|}{>COR_1}}, \overset{O}{\underset{|}{>CC-R_1}}, \overset{O}{\underset{|}{>CC-OR_1}},$

35

36

37

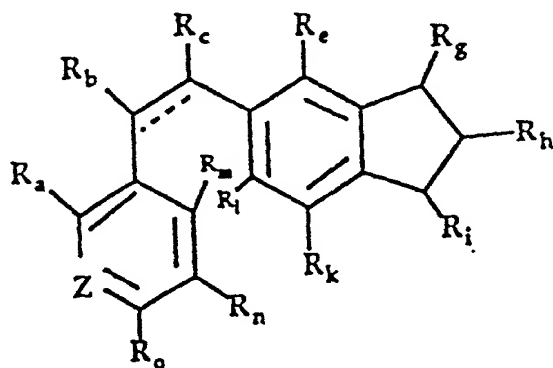
$\overset{OH}{\underset{|}{>CC-R_1}}, \overset{OH}{\underset{|}{>CC-OR}};$

38 or

39 B) Z is $=C-X'$ or $-X'-C=$, where R_p
 40 $\begin{array}{c} | \\ R_p \end{array}$ $\begin{array}{c} | \\ R_p \end{array}$
 41
 42 is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$;
 43 and X' is X , as defined above;
 44 or X' is $>C=O$;
 45 where, in each formula set forth above, each R_1 and R_2
 46 independently is $-H$, or substituted or unsubstituted alkyl,
 47 alkenyl or alkynyl group of 1-6 carbons; and the bond
 48 indicated by $C \bullet \bullet \bullet C$ is absent or, in combination with the $C-C$
 49 bond, is the unit $HC=CH$.

1 6. A method for treating a mammalian disease
 2 characterized by abnormal cell mitosis, said method
 3 comprising administering to a mammal a cell-mitosis-
 4 inhibiting compound of the formula below, said compound
 5 being administered in an amount sufficient to inhibit cell
 6 mitosis:

7



8 wherein:

9 I. R_a-R_o are defined as follows:

10 A) each $R_a, R_b, R_c, R_e, R_g, R_h, R_k, R_l, R_m, R_n,$
11 R_o independently is $-R_1, -OR_1, -OCOR_1,$
12 $-SR_1, -F, -NHR_2, -Br, \text{ or } -I;$ and R_1 is $-R_1,$
13 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or
14 $-C\equiv CH;$

15 or

16 B) each $R_a, R_e, R_l, R_m, R_n, R_o$ independently
17 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
18 $-I$ and each R_b, R_c, R_g, R_h is $=O, -R_1,$
19 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I;$
20 and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F,$
21 $-NHR_1, -Br, -I$ or $-C\equiv CH;$

22 or

23 C) each $R_a, R_b, R_c, R_e, R_k, R_m, R_n, R_o$
24 independently is $-R_1, -OR_1, -OCOR_1, -SR_1,$
25 $-F, -NHR_2, -Br, -I,$ and each R_h, R_l
26 independently is $=O, -R_1, -OR_1, -OCOR_1,$
27 $-SR_1, -F, -NHR_1, -Br$ or $-I;$ and R_i is $=O,$
28 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$
29 or $-C\equiv CH;$

30 and

31 I. Z is defined as follows:

32 A) Z is $X,$ where X is $>COR_1, >\overset{O}{\underset{|}{CC}}-R_1, >\overset{O}{\underset{|}{CC}}-OR_1,$
33
34

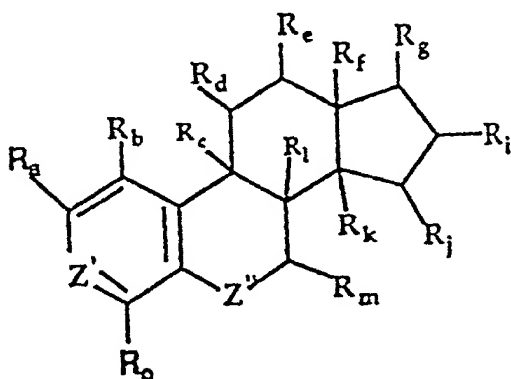
35 $>\overset{OH}{\underset{|}{CC}}-R_1, >\overset{OH}{\underset{|}{CC}}-OR;$
36
37

38 or

39 B) Z is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_p \end{array}$, where R_p
 40
 41
 42 is $-\text{R}_1$, $-\text{OR}_1$, $-\text{SR}_1$, $-\text{F}$, $-\text{NHR}_2$, $-\text{Br}$ or $-\text{I}$,
 43 and X' is X , as defined above;
 44 or X' is $=\text{O}$;
 45 where, in each formula set forth above, each R_1 and R_2
 46 independently is $-\text{H}$, or substituted or unsubstituted alkyl,
 47 alkenyl or alkynyl group of 1-6 carbons; and the bond
 48 indicated by $\text{C}\bullet\bullet\text{C}$ is absent or, in combination with the $\text{C}-\text{C}$
 49 bond is the unit $\text{HC}=\text{CH}$.

1 7. A compound of the general formula below, said
 2 compound being a cell-mitosis-inhibiting compound:

3



4 wherein:

5 I. R_a-R_o are defined as follows:

6 (A) each $R_a, R_b, R_c, R_d, R_e, R_f, R_i, R_j, R_k, R_l,$
7 R_m, R_o , independently is $-R_1, -OR_1,$
8 $-OCOR_1, -SR_1, -F, -NHR_2, -Br$, or $-I$; and R_g
9 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
10 $-I$ or $-C\equiv CH$;

11 or

12 (B) each $R_a, R_b, R_c, R_f, R_k, R_l, R_o$, is $-R_1,$
13 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br$, or $-I$;
14 and each R_d, R_e, R_i, R_j, R_m , independently
15 is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2,$
16 $-Br$ or $-I$; and R_g is $=O, -R_1, -OR_1, -OCOR_1,$
17 $-SR_1, -F, -NHR_2, -Br, -I$ or $-C\equiv CH$;

18 and

19 II. Z' is defined as follows:

20 A) Z' is X, where X is $>COR_1, \overset{O}{\underset{|}{>CC-R_1}},$
21
22

23 $\overset{O}{\underset{|}{>CC-OR_1}}, \overset{OH}{\underset{|}{>CC-R_1}}, \overset{OH}{\underset{|}{>CC-OR_1}};$
24
25

26 or

27 B) Z' is $=C-X'-$ or $-X'-C=$, where R_n
28 $\underset{|}{R_n} \qquad \qquad \underset{|}{R_n}$

29 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I$;
30 or X' is X, as defined above; or
31 X' is $>C=O$;
32

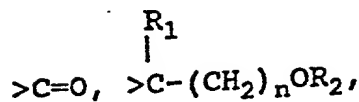
33 and

34 III. Z'' is defined as follows:

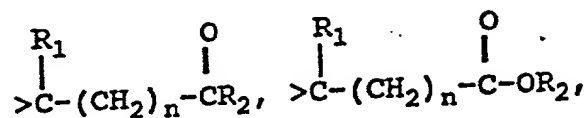
35
36
37

A) z'' is Y, where Y is $-O-$, $-\overset{\overset{R_1}{|}}{N}-$, $>\overset{\overset{R_1}{|}}{C}HR_1$,

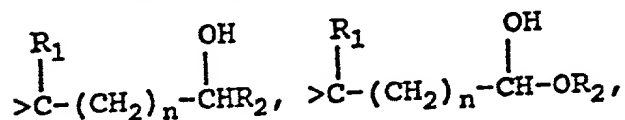
38
39
40



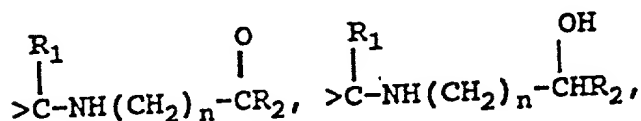
41
42
43



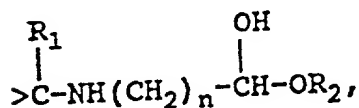
44
45
46



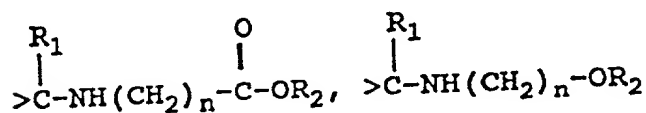
47
48
49



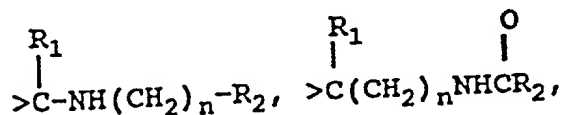
50
51
52



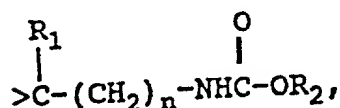
53
54
55



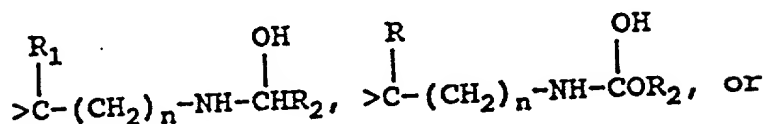
56
57
58



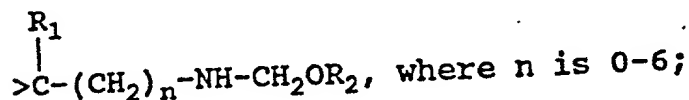
59
60
61



62
63
64



65
66
67



68 or

69
70
71

B) z'' is $-Y-\overset{\overset{R_p}{|}}{CH}-$ or $-\overset{\overset{R_p}{|}}{CH}-Y-$ where R_p

72 is $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br$ or $-I$;

73 provided that when:

74 3) each $R_b, R_c, R_d, R_e, R_j, R_k, R_l, R_m$ is $-H$;

75 R_f is $-CH_3$;

76 R_g is $-OH, -OCCH_3$;

77 R_i is $-H, -OH$, or $=O$;

78 R_o is $-H$ or $-Br$;

79 Z' is $>COH$; and

80 Z'' is $>CH_2$ or $-OH$; then

81 R_a is not $-F, -Br, -OH$ or $-H$;

83

84 and

85 4) each $R_b, R_c, R_d, R_e, R_i, R_j, R_k, R_l,$

86 R_m is $-H$;

87 R_f is $-CH_3$;

88 R_g is $-OH$; and

89 Z'' is $>CH_2$; then

90 Z' is not $>COCH_3$ or $>COCCH_3$; and

91 each R_a, R_o independently or together are

92 not $-OCH_3$ or $-H$;

94

95 and

96 5) each $R_c, R_e, R_j, R_k, R_l, R_m, R_o$ is $-H$;

97 R_a is $-H$ or $-OCH_3$;

98 R_b is $-H$ or $-CH_3$;

99 R_d is $-OH$;

100 R_f is $-CH_3$;

101 R_g is $=O$;

102 R_i is $-OH, =O$ or $-C\equiv CH$; and

103 Z'' is $>CH_2$; then

104 Z' is not $>COH, >COCCH_3$, or $-H$;

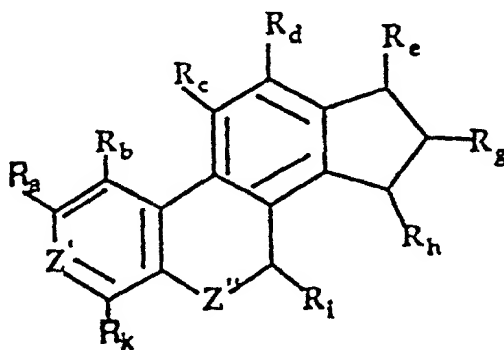
105

106

107 where, in each formula set forth above, each R_1 and R_2
108 independently is -H, or substituted or unsubstituted alkyl,
109 alkenyl or alkynyl group of 1-6 carbons.

1 8. A compound of the general formula below, said
2 compound being a cell-mitosis-inhibiting compound:

3



4 wherein:

5 I. R_a - R_k are defined as follows:

6 A) each $R_a, R_b, R_c, R_d, R_g, R_h, R_i, R_k$
7 independently is $-R_1, -OR_1, -OCOR_1, -SR_1,$
8 $-F, -NHR_2, -Br, \text{ or } -I$; and R_e is $-R_1, -OR_1,$
9 $-OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or $-C\equiv CH$;

10 or

11 B) each R_a, R_b, R_c, R_d, R_k is $-R_1, -OR_1,$
12 $-OCOR_1, -SR_1, -F, -NHR_2, -Br, \text{ or } -I$; and
13 each R_g, R_h, R_i , independently is $=O$,

-R₁, -OR₁, -OCOR₁, -SR₁, -F, -Br, or -I;
and R_e is =O, -R₁, -OR₁, -OCOR₁, -SR₁, -F,
-Br, -I or -C≡CH;

and

I. Z' is defined as follows:

A) Z' is X, where X is $\begin{array}{c} \text{O} \\ | \\ >\text{C}-\text{R}_1 \end{array}$, $\begin{array}{c} \text{O} \\ | \\ >\text{C}_2-\text{C}-\text{R}_1 \end{array}$,

$\begin{array}{c} \text{O} \\ | \\ >\text{C}_2-\text{C}-\text{OR}_1 \end{array}$, $\begin{array}{c} \text{OH} \\ | \\ >\text{C}-\text{C}-\text{R}_1 \end{array}$, $\begin{array}{c} \text{OH} \\ | \\ >\text{C}-\text{C}-\text{OR}_1 \end{array}$;

or

B) Z' is $\begin{array}{c} \text{R}_n \\ | \\ =\text{C}-\text{X}' \end{array}$ or $\begin{array}{c} \text{R}_n \\ | \\ -\text{X}'-\text{C}= \end{array}$, where R_n
is -R₁, -OR₁, -SR₁, -F, -NHR₂, -Br or -I,
and X' is X, as defined above;
or X' is also >C=O;

and

II. Z'' is defined as follows:

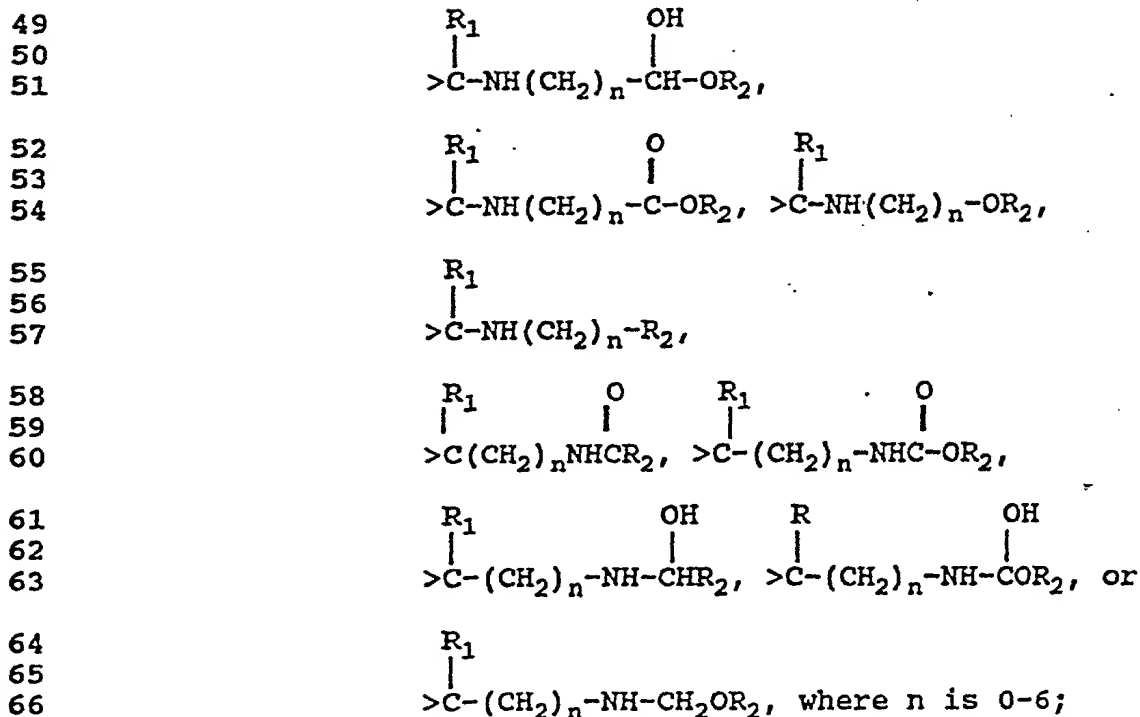
A) Z'' is Y, where Y is $\begin{array}{c} \text{R}_1 \\ | \\ -\text{O}- \end{array}$, $\begin{array}{c} \text{R}_1 \\ | \\ -\text{N}- \end{array}$, $\begin{array}{c} \text{R}_1 \\ | \\ >\text{CH}-\text{R}_1 \end{array}$,

$\begin{array}{c} \text{R}_1 \\ | \\ >\text{C}=\text{O} \end{array}$, $\begin{array}{c} \text{R}_1 \\ | \\ >\text{C}-(\text{CH}_2)_n-\text{OR}_2 \end{array}$,

$\begin{array}{c} \text{R}_1 \\ | \\ >\text{C}-(\text{CH}_2)_n-\text{C}-\text{R}_2 \end{array}$, $\begin{array}{c} \text{O} \\ | \\ >\text{C}-(\text{CH}_2)_n-\text{C}-\text{OR}_2 \end{array}$,

$\begin{array}{c} \text{R}_1 \\ | \\ >\text{C}-(\text{CH}_2)_n-\text{CH}-\text{R}_2 \end{array}$, $\begin{array}{c} \text{OH} \\ | \\ >\text{C}-(\text{CH}_2)_n-\text{CH}-\text{OR}_2 \end{array}$,

$\begin{array}{c} \text{R}_1 \\ | \\ >\text{C}-\text{NH}(\text{CH}_2)_n-\text{C}-\text{R}_2 \end{array}$, $\begin{array}{c} \text{O} \\ | \\ >\text{C}-\text{NH}(\text{CH}_2)_n-\text{C}-\text{OR}_2 \end{array}$,

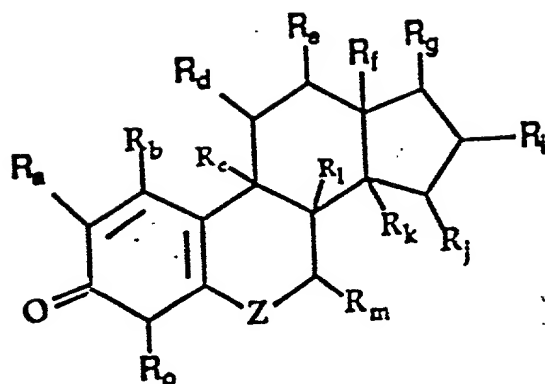


67 or

68 B) Z'' is $-Y-CH-$ or $-CH-Y-$, where R_p is
 69
$$\begin{array}{c} | \quad \quad | \\ R_p \quad R_p \end{array}$$

 70
 71 $-R_1, -OR_1, -SR_1, -F, -NHR_2, -Br \text{ or } -I;$
 72 where, in each formula set forth above, each R_1 and R_2
 73 independently is $-H$, or substituted or unsubstituted alkyl,
 74 alkenyl or alkynyl group of 1-6 carbons.

1 9. A compound of the general formula below, said
 2 compound being a cell-mitosis-inhibiting compound:



3 wherein:

4 I. R_a-R_o are defined as follows:

5 A) each $R_a, R_b, R_c, R_d, R_e, R_f, R_i, R_j, R_k, R_l,$
 6 R_m, R_o independently is $-R_1, -OR_1, -OCOR_1,$
 7 $-SR_1, -F, -NHR_2, -Br, \text{ or } -I$; and R_g is $-R_1,$
 8 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or
 9 $-C\equiv CH$;

10 or

11 B) each $R_a, R_b, R_c, R_f, R_k, R_l$ independently
 12 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
 13 or $-I$; and each $R_d, R_e, R_i, R_j, R_m, R_o$
 14 independently is $=O, -R_1, -OR_1, -OCOR_1,$
 15 $-SR_1, -F, -NHR_2, -Br, -I$; and R_g is $=O,$
 16 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$
 17 or $-C\equiv CH$;

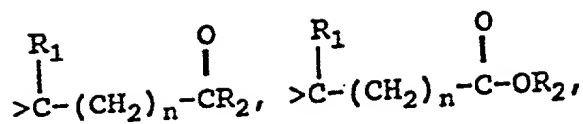
18 and

19 II. Z is defined as follows:

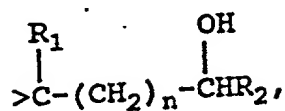
20 A) Z is Y , where Y is $-O-, -N-, >CHR_1,$
 21 $>C=O, >C-(CH_2)_nOR_2,$
 22

23 $>C=O, >C-(CH_2)_nOR_2,$
 24
 25

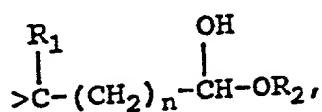
26
27
28



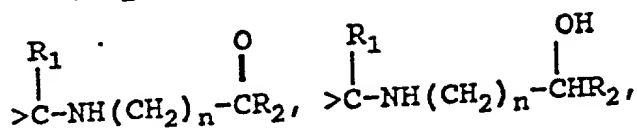
29
30
31



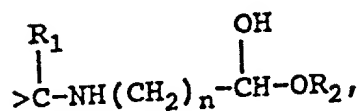
32
33
34



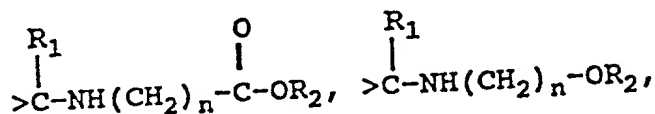
35
36
37



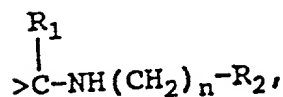
38
39
40



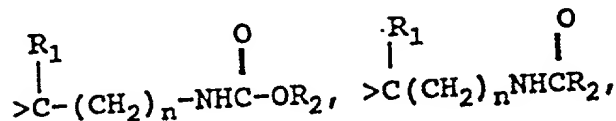
41
42
43



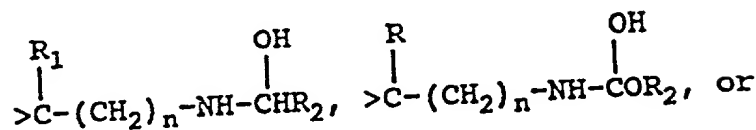
44
45
46



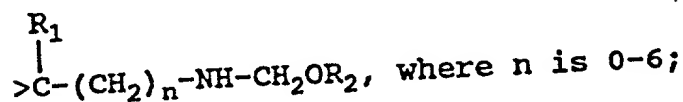
47
48
49
50



51
52
53



54
55
56



57 or

58
59
60

B) Z is $\begin{array}{c} -\text{Y}-\text{CH}- \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} -\text{CH}-\text{Y}- \\ | \\ \text{R}_n \end{array}$, where R_n

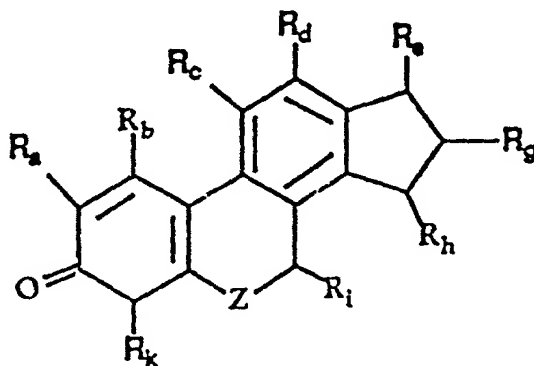
61

is $-\text{R}_1$, $-\text{OR}_1$, $-\text{SR}_1$, $-\text{F}$, $-\text{NHR}_2$, $-\text{Br}$ or $-\text{I}$;

62 where, in each formula set forth above, each R_1 and R_2
63 independently is -H, or substituted or unsubstituted alkyl,
64 alkenyl or alkynyl group of 1-6 carbons.

1 10. A compound of the general formula below, said
2 compound being a cell-mitosis-inhibiting compound:

3



4 wherein:

5 I. R_a - R_k are defined as follows:

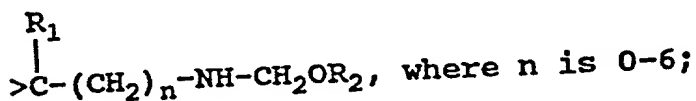
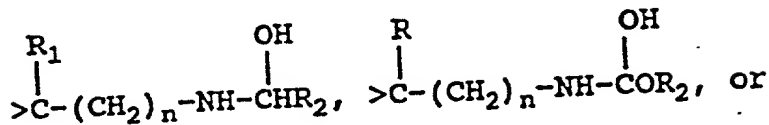
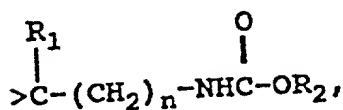
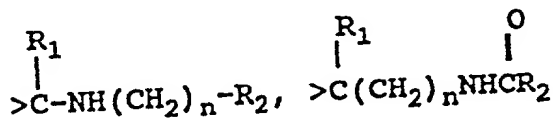
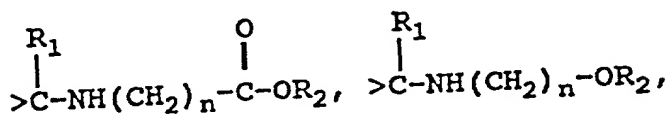
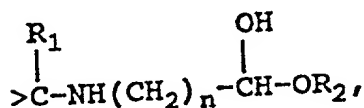
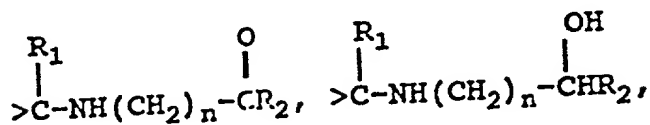
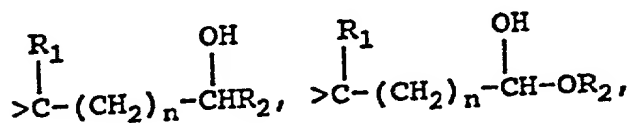
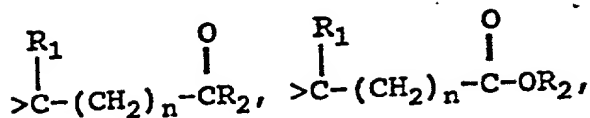
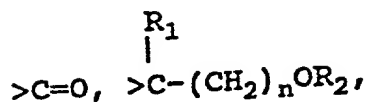
6 A) each R_a , R_b , R_c , R_d , R_g , R_h , R_i , R_k
7 independently is $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$,
8 $-F$, $-NHR_1$, $-Br$, or $-I$; and R_e is $-R_1$, $-OR_1$,
9 $-OCOR_1$, $-SR_1$, $-F$, $-NHR_1$, $-Br$, $-I$ or $-C\equiv CH$;

10 or

11 B) each R_a , R_b , R_c , R_d , independently is $-R_1$,
12 $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_1$, $-Br$, or $-I$;
13 and each R_g , R_h , R_i , R_k independently is
14 $=O$, $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_1$, $-Br$
15 or $-I$; and R_e is $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$,
16 $-F$, $-NHR_1$, $-Br$, $-I$ or $-C\equiv CH$;

17 II. Z is defined as follows:

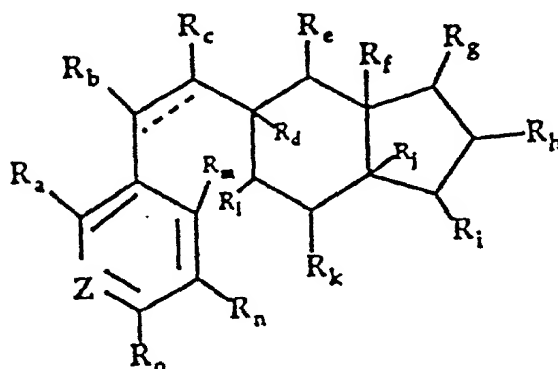
18
19
20 1) Z is Y, where Y is $\begin{array}{c} \text{R}_1 \\ | \\ -\text{O}-, -\text{N}-, >\text{CHR}_1, \end{array}$



51 or

52 Z is $-Y-CH-$ or $-CH-Y-$, where R_n
 53 $\begin{array}{c} | \\ R_n \end{array}$ $\begin{array}{c} | \\ R_n \end{array}$
 54
 55 is $-R_1$, $-OR_1$, $-SR_1$, $-F$,
 56 $-NHR_2$, $-Br$ or $-I$;
 57 where, in each formula set forth above, each R_1 and R_2
 58 independently is $-H$, or substituted or unsubstituted alkyl,
 59 alkenyl or alkynyl group of 1-6 carbons.

1 11. A compound of the general formula below, said
 2 compound being a cell-mitosis-inhibiting compound:
 3



4 wherein:
 5 I. R_a-R_o are defined as follows:
 6 A) each R_a , R_b , R_c , R_d , R_e , R_f , R_g , R_h , R_j , R_k ,
 7 R_l , R_m , R_n , R_o independently is $-R_1$, $-OR_1$,
 8 $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$, or $-I$; and R_i
 9 is $-R_1$, $-OR_1$, $-OCOR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$,
 10 $-I$ or $-C\equiv CH$;

11 or

12 B) each $R_a, R_d, R_f, R_j, R_m, R_n, R_o$
13 independently is $-R_1, -OR_1, -OCR_1, -SR_1,$
14 $-F, -NHR_2, -Br, -I$; and each $R_b, R_c, R_e,$
15 R_g, R_h, R_k, R_l independently is $=O, -R_1,$
16 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I$;
17 and R_i is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F,$
18 $-NHR_1, -Br, -I$ or $-C\equiv CH$;

19 or

20 C) each $R_a, R_b, R_c, R_d, R_f, R_j, R_m, R_n, R_o$
21 independently is $-R_1, -OR_1, -OCR_1, -SR_1, -F,$
22 $-NHR_2, -Br, -I$; and each R_e, R_g, R_h, R_k, R_l
23 independently is $=O, -R_1, -OR_1, -OCOR_1,$
24 $-SR_1, -F, -NHR_1, -Br$ or $-I$; and R_i is $=O,$
25 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$
26 or $-C\equiv CH$;

27 and

28 I. Z is defined as follows:

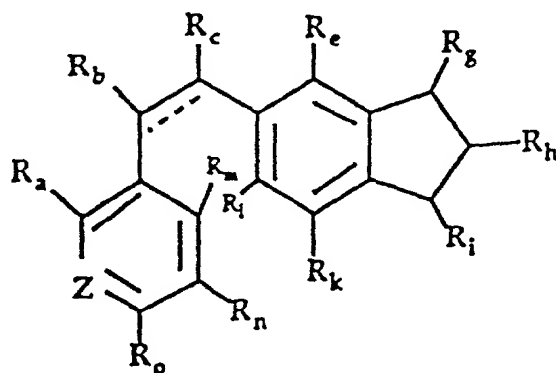
29
30 1) Z is X, where X is $\begin{array}{c} O \\ | \\ >COR_1, >CC-R_1, >CC-OR_1, \end{array}$
31

32 $\begin{array}{c} OH \\ | \\ >CC-R_1, \end{array}$ $\begin{array}{c} OH \\ | \\ >CC-OR, \end{array}$ or
33
34

35 Z is $=C-X'-$ or $-X'-C=$, where R_p
 36 $\begin{array}{cc} | & | \\ R_p & R_p \end{array}$
 37
 38 is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$;
 39 and X' is X , as defined above;
 40 or X' is $>C=O$;
 41 where, in each formula set forth above, each R_1 and R_2
 42 independently is $-H$, or substituted or unsubstituted alkyl,
 43 alkenyl or alkynyl group of 1-6 carbons; and the bond
 44 indicated by $C\cdots C$ is absent or, in combination with the $C-C$
 45 bond is the unit $HC=CH$.

1 12. A compound of the general formula below, said
 2 compound being a cell-mitosis-inhibiting compound:

3



4 wherein:

5 I. R_a-R_o are defined as follows:

- 6 A) each $R_a, R_b, R_c, R_e, R_g, R_h, R_k, R_l, R_m, R_n,$
7 R_o independently is $-R_1, -OR_1, OCOR_1, -SR_1,$
8 $-F, -NHR_2, -Br, \text{ or } -I$; and R_1 is $-R_1, -OR_1,$
9 $-OCOR_1, -SR_1, -F, -NHR_2, -Br, -I$ or $-C\equiv CH$;
- 10 or
- 11 B) each $R_a, R_e, R_l, R_m, R_n, R_o$ independently
12 is $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_2, -Br,$
13 $-I$; and each R_b, R_c, R_g, R_h is $=O, -R_1,$
14 $-OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br$ or $-I$;
15 and R_1 is $=O, -R_1, -OR_1, -OCOR_1, -SR_1, -F,$
16 $-NHR_1, -Br, -I$ or $-C\equiv CH$;
- 17 or
- 18 C) each $R_a, R_b, R_c, R_e, R_k, R_m, R_n, R_o$
19 independently is $-R_1, -OR_1, OCOR_1, -SR_1,$
20 $-F, -NHR_2, -Br, -I$; and each R_g, R_h
21 independently is $=O, -R_1, -OR_1, -OCOR_1,$
22 $-SR_1, -F, -NHR_1, -Br$ or $-I$; and R_1 is $=O,$
23 $-R_1, -OR_1, -OCOR_1, -SR_1, -F, -NHR_1, -Br, -I$
24 or $-C\equiv CH$;

25 and

26 II. Z is defined as follows:

- 27 A) Z is X , where X is $>COR_1, >\overset{O}{\underset{|}{CC}}-R_1, >\overset{O}{\underset{|}{CC}}-OR_1,$
28
29



33 or

- 34 B) Z is $=\underset{\underset{R_p}{|}}{C}-X'-$ or $-X'-\underset{\underset{R_p}{|}}{C}=$, where R_p
35
36

37 is $-R_1$, $-OR_1$, $-SR_1$, $-F$, $-NHR_2$, $-Br$ or $-I$,
 38 and X' is X , as defined above;
 39 or X' is $=O$;
 40 where, in each formula set forth above, each R_1 and R_2
 41 independently is $-H$, or substituted or unsubstituted alkyl,
 42 alkenyl or alkynyl group of 1-6 carbons; and the bond
 43 indicated by $C\bullet\bullet\bullet C$ is absent or, in combination with the $C-C$
 44 bond is the unit $HC=CH$.

1 13. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-methoxyestradiol.

1 14. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-fluoroestradiol.

1 15. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-bromoestradiol.

1 16. The method of claim 1, wherein said
 2 cell-mitosis-inhibiting composition is 2-methoxyestrone.

1 17. The method of claim 1, wherein said cell-
 2 mitosis-inhibiting composition is 17-ethynylestradiol.

1 18. The method of claims 1 or 2 wherein said
 2 compound is further characterized in that

3 A) Z' is $\begin{array}{c} \text{=C-X'-} \\ | \\ R_n \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ R_n \end{array}$; and

6 Z'' is $\begin{array}{c} \text{-Y-CH-} \\ | \\ R_p \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ R_p \end{array}$; or

9 B) Z' is X ; and Z'' is $\begin{array}{c} \text{-Y-CH-} \\ | \\ R_p \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ R_p \end{array}$; or

12 c) Z' is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_n \end{array}$; and Z" is Y.
 13
 14

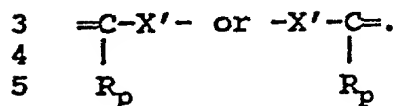
1 19. The method of claims 3 or 4 wherein said
 2 compound is further characterized in that Z is
 3 $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_n \end{array}$.
 4
 5

1 20. The method of claims 5 or 6 wherein said
 2 compound is further characterized in that Z is
 3 $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_p \end{array}$.
 4
 5

1 21. The compound of claims 7 or 8, wherein said
 2 compound is further characterized in that
 3 A) Z' is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_n \end{array}$; and
 4
 5
 6 Z" is $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_p \end{array}$; or
 7
 8
 9 B) Z' is X; and Z" is $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_p \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_p \end{array}$; or
 10
 11
 12 C) Z' is $\begin{array}{c} \text{=C-X'-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-X'-C=} \\ | \\ \text{R}_n \end{array}$; and Z" is Y.
 13
 14

1 22. The compound of claims 9 or 10, wherein said
 2 compound is further characterized in that Z is
 3 $\begin{array}{c} \text{-Y-CH-} \\ | \\ \text{R}_n \end{array}$ or $\begin{array}{c} \text{-CH-Y-} \\ | \\ \text{R}_n \end{array}$.
 4
 5

1 23. The compound of claims 11 or 12, wherein said
2 compound is further characterized in that Z is



1 24. The method of any one of claims 1-6, wherein at
2 least one of R_a→R_p is -OCH₃.

1 25. The compound of any one of claims 7-12, wherein
2 at least one of R_a→R_p is -OCH₃.